

## **IN THE CLAIMS**

1. (ORIGINAL) A process for synthesizing a particulate copolymer comprising: providing a reaction mixture comprising a reaction medium, a polymerization stabilizer, a water-insoluble ethylenically unsaturated monomer and an ethylenically unsaturated monomer containing hydrophilic functionality, said reaction mixture having a viscosity value of at least 10 cps measured at 40°C, and polymerizing the water-insoluble ethylenically unsaturated monomer and the ethylenically unsaturated monomer containing hydrophilic functionality.

2. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein said reaction mixture has a viscosity of at least 25 cps measured at 40 °C.

3. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein said reaction medium comprises a mixture of water and at least one aliphatic alcohol having from 1 to 5 carbon atoms.

4. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein the reaction medium comprises a water/alcohol mixture in a weight ratio from 1:1 to 3:1.

5. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein the polymerization stabilizer is selected from the group consisting of polyvinylpyridine, poly-N-vinylimidazole, polyethyleneimine polyvinylpyrrolidone, polyvinylalcohol, acid-processed gelatin and alkali-processed gelatin.

6. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein the water-insoluble ethylenically unsaturated monomer is selected from the group consisting of methylacrylate, methylmethacrylate, ethylacrylate, ethylmethacrylate, butylmethacrylate and butylacrylate.

7. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 1, wherein the ethylenically unsaturated monomer containing hydrophilic functionality is selected from the group consisting of acrylic acid, methacrylic acid, ethacrylic acid, hydroxyethyl methacrylate, hydroxyethyl acrylate, itaconic acid, maleic acid, fumaric acid, monoalkyl itaconate, monoalkyl maleate, citraconic acid, styrenecarboxylic acid, aminomethylstyrene, styrene sulfonic acid, methacryloxyethyltrimethyl ammonium chloride, acryloxyethyltrimethyl ammonium chloride, methacryloxyethyldimethyl-benzyl ammonium chloride, dimethylaminoethylmethacrylate and dimethylamino-ethyl ethacrylate.

8. (ORIGINAL) A process for synthesizing a particulate copolymer comprising the steps of (a) dispersing a polymerization stabilizer in a reaction medium, (b) heating the reaction mixture to a temperature within the range of from 60° to 90°C, (c) adding to the reaction mixture a water-insoluble ethylenically unsaturated monomer and a ethylenically unsaturated monomer containing hydrophilic functionality, (d) adding to the reaction mixture a polymerization catalyst, and (e) maintaining the reaction mixture at reflux temperature until completion of polymerization, characterized in that, at the end of step (c), said reaction mixture has a viscosity value of at least 10 cps measured at 40 °C.

9. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 8, wherein the polymerization catalyst is selected from the group consisting of an azo initiator and a peroxide initiator.

10. (ORIGINAL) A process for synthesizing a particulate copolymer as in claim 8, wherein the polymerization catalyst is selected from the group consisting of 2,2'-azobisisobutyronitrile, 2,2'-azobis(2,4-dimethylvaleronitrile), benzoyl peroxide and lauryl peroxide.

11. (CANCELLED)

12. (CANCELLED)

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20. (CANCELLED)

21. (CURRENTLY AMENDED) A process for synthesizing a particulate copolymer as in claim 1, wherein said reaction mixture has a viscosity of ~~[[between 7 and]]~~ less than 42 cps measured at 40°C.

22. (CURRENTLY AMENDED) A process for synthesizing a particulate copolymer as in claim 3, wherein said reaction mixture has a viscosity of ~~[[between 7 and]]~~ less than 42 cps measured at 40°C.

23. (CURRENTLY AMENDED) A process for synthesizing a particulate copolymer as in claim 7, wherein said reaction mixture has a viscosity of ~~[[between 7 and]]~~ less than 42 cps measured at 40°C.

**CONFIRMATION OF RESTRICTION/ELECTION**

Applicants hereby confirm their election of claims 1-10 for prosecution on the merits and new claims 21-23. All other non-elected claims have been cancelled, Applicants reserving their right to file divisional applications on the non-elected subject matter.

### **SUMMARY OF THE OFFICE ACTION**

1. Claims 21-23 were rejected under 35 USC 112, second paragraph as not narrowing the claim from which they depended. .
2. Claims 1, 2, 8-10 and 21-23 were rejected under 35 USC 102(b) or alternatively under 35 USC 103(a) as anticipated by or as unpatentable over Goldberg (US Patent No. 3,301,809).
3. Claims 1-10 were rejected under 35 USC 102(b) or alternatively under 35 USC 103(a) as anticipated by or as unpatentable over Kun Cao (Macromol. Symp. 150, 2000, pp. 195-200).

## **RESPONSE TO THE ISSUES IN THE OFFICE ACTION**

### **1. Rejection under 35 USC 112.**

Applicants have appropriately amended the claims. Claims 1-10 recite at least 10 cps. Claims 21-23 recite less than 42 cps. This is consistent claim language and finds antecedent basis in the specification as originally filed.. The inventorship remains the same with respect to the original filing of the Application.

**The discussions of the traversal of the rejections based on cited art will begin with the Kun Cao reference in paragraph 4, as that is believed to be a more logical starting point for the analysis.**

2. Claims 1-10 were rejected under 35 USC 102(b) or alternatively under 35 USC 103(a) as anticipated by or as unpatentable over Kun Cao (Macromol. Symp. 150, 2000, pp. 195-200).

The (Kun Cao article) has been the starting point of the research and development which conducted to the present invention. This document is acknowledged in the background of the art section of the present application. As noted in the original specification of this application, the viscosity of the mixture in the reaction medium of Kun Cao is lower than 5 cps (measured at 40°C with a Brookfield viscometer). The addition of hydrophilic comonomer causes poor stability and decreases flexibility of polymerization conditions. **There is no anticipation of the limitation of at least 7 cps at 40C in Kun Cao**, and the claims cannot be anticipated. **There is no basis of record for changing the viscosity with an expectation of the improvements applicants have noted in the specification and examples.** There can be no obviousness of these claims.

Kun Cao deals with the preparation of monodisperse copolymer particles in the range of 1-5  $\mu\text{m}$  by unseeded batch dispersion copolymerization of methylmethacrylate (MMA) as major monomer in methanol-water medium using an azo-type initiator and PVP as steric dispersant. The effects of type and concentration of comonomers on the latex stability, particle size and monodispersity of the copolymer particles was the scope of the investigation. The investigated ethylenically unsaturated

monomers containing hydrophilic functionality were acrylic acid (AA) and methacrylic acid (MAA) (page 196, lines 1-3).

On page 197, lines 3 – 6, Kun Cao clearly states “Figures 2 and 3 show that the particle size increases and the size distribution tend to be more monodisperse when a small amount of AA or MAA is added. On the contrary, the particle size will decrease and its distribution tends to be broader owing to second particle formation stage if ratio of AA or MAA to MMA is more than certain value, leading to unstabilization”.

It is worth noting Figs. 2 and 3 on page 198 (of Kun Cao) which show the effect of the ratio of MMA to AA or MAA on particle size and particle size distribution. In both cases, it is clearly evident that the author of the article tested a percentage of comonomer (AA or MAA) not higher than 10 % relative to the MMA and that, starting from a proportion of AA and MAA of about 5%, the particle size distribution had an abrupt increase.

Accordingly, it is clear that the disclosure of Kun Cao showed the presence of the problem that the present invention is now solving. This was also clear in the comment on page 4, lines 21-26 of the present application where it was stated that “The addition of hydrophilic comonomer causes poor stability and decreases flexibility of polymerization conditions. Moreover, the partitioning of functional group chemically anchored on the surface of the copolymer particles is poorly controlled. This may be a fatal weakness for application of an unseeded batch dispersion process to obtain a copolymer including an effective amount of an ethylenically unsaturated monomer containing hydrophilic functional group”.

As noted in the original specification of this application, the viscosity of the mixture in the reaction medium is lower than 5 cps (measured at 40°C with a Brookfield viscometer). The addition of hydrophilic comonomer causes poor stability and decreases flexibility of polymerization conditions. There is no anticipation of the limitation of at least 7 cps at 40C in Kun Cao, and the claims cannot be anticipated. There is no basis of record for changing the viscosity with an expectation of the improvements applicants have noted in the specification and examples. There can be no obviousness of these claims.

3. Claims 1-10 were rejected under 35 USC 102(b) or alternatively under 35 USC 103(a) as anticipated by or as unpatentable over Sekmakas (US Patent No. 4,076,677).

First, with respect to the Comments in the Final rejection, the failure of a reference to state limitations on features is not a teaching of those limitations. The fact that these references do not specifically state a limitation on viscosity is not a teaching that any viscosity can be used. On that basis alone, the rejections must fail.

The disclosure Semakas ( US Patent 4,076,677) and Goldberg (US Patent No. 3,301,809) is nothing more than a confirmation that there was a general knowledge in the art about the difficulty of applying dispersion polymerization to copolymer containing an effective amount of ethylenically unsaturated comonomer containing hydrophilic functionality.

In fact, the examples of Semakas describe a content of acrylic acid lower than 10% relatively to the total amount of comonomers (see column 5, lines 34-37 and column 5, line 67 to column 6 line 2) and similarly do the Examples of Goldberg. Accordingly, the presently amended claim 8 which includes the features of claims 9 and 10 as well as the provision of providing an effective amount of an ethylenically unsaturated monomer containing hydrophilic functional group within the claimed copolymer is considered novel over the prior art mentioned by the Examiner.

There are addition arguments against Goldberg (US 3,301,809), besides those objections that are similar to those for the previous citations, that is the low amount of hydrophylic monomer. The cited Goldberg patent teaches and claims the possibility of preparing a co-polymer of Vinyl acetate and N-metylolacrylamide by emulsion polymerization. This means starting from a monomer emulsion obtained through the use of a suitable emulsifier (in this case an appropriate hydrolysis degree PVA is used). This step is different from what that claimed. The present claims are related to dispersion polymerization, which is distinct from emulsion polymerization and has different physical and chemical environment requirements.

For example, in claims 1 and 5, the Goldberg patent refers to the viscosity of PVA used as emulsifier, and not to the viscosity of the reaction medium as specified in the claims of this case.



The amount of N-methylolacrylamide that can be introduced with the process described in Goldberg (e.g., claim 2) is, however, limited from 1 to 16%; opposite the amounts in the claimed process where up to 50% w/w can be introduced with respect to the hydrophylic monomer. The reference to viscosity of the emulsion at the beginning of the reaction in the Goldberg (the presently claimed process case is not preformed as an emulsion) is made only in claim 10, and are indicated as very high viscosity, between 500 and 10000 cps. In the experimentation described in the present application, viscosity up to 42 cps at most are reported.

It must be taken into further account that the synthetic method proposed in Goldberg shows many practical disadvantages and scarce reproducibility (emulsifying Vinyl acetate and the radical initiator in water, with the aid of a stabilizer, elevated temperatures, then adding an aqueous solution of N-methylolacrylamide). To obtain reproducible bead dimensions, the distribution of the water soluble monomer in the two phases should be always the same, which is not obtainable with the process described in the Goldberg patent.